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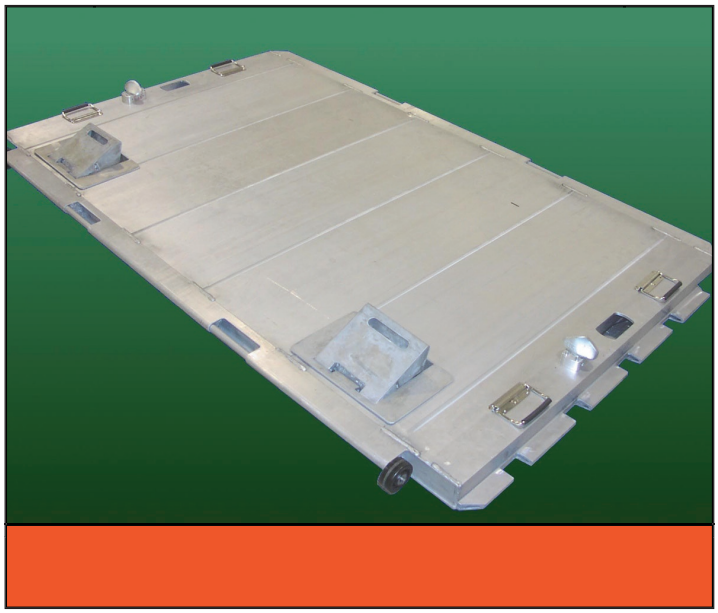
Science and Technology for Tomorrow's Air and Space Force

Success Story

ALUMINUM ALLOY WELDING PROCESS HELPS ARMY STREAMLINE AIRLIFT OPERATIONS



A Materials and Manufacturing Directorate-developed aluminum alloy welding process proved critical in manufacturing the United States (US) Army's new cargo interface pallet. The Army expects the new pallet, called a "Slipper," to streamline airlift and deployment, improve readiness, and save about $315 million in fabrication cost. Directorate engineers performed much of the work on the new welding process in house including weld characterization, fracture and fatigue tests and analysis, and corrosion testing and analysis.

The directorate's innovative contribution to the development of the new pallet exemplifies the importance of in-house materials research and development in support of the warfighter. This effort has a major impact on airlift operations and the rapid deployment of US military personnel and equipment throughout the world.

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Accomplishment

Directorate engineers supported an innovative research and development effort by the Boeing Company that reduces the time, manpower, equipment, and costs the Army incurs to airlift cargo on Air Force C-17, C-5A, and C-130J transport aircraft. Directorate engineers developed the welding process for the aluminum alloy used to make a specially designed pallet that can move the Army's standard cargo platforms on and off the aircraft and secure them in place while the aircraft is in flight.

Background

Engineers at the directorate's Metals, Ceramics, and Nondestructive Evaluation Division supported an innovative research and development effort, led by Boeing, that increases the efficiency and reduces the cost of transporting Army cargo on C-17, C-5A, and C-130J aircraft. The researchers assisted in the creation of an aircraft cargo interface pallet, referred to as a Slipper.

The Army expects the Slipper pallet to streamline airlift and deployment, improve readiness, and save millions of dollars. The pallet is a lightweight, sandwich aluminum panel that locks the Army's Container Roll-Out Platform (CROP) directly to the cargo floor.

By using a Slipper and the CROP, the Army can load directly to and from all three aircraft, saving time, reducing personnel resources, cutting back on the use of support equipment, and trimming costs. The Slipper is 88 in. wide and 50 in. long. Each CROP requires two Slippers.

Directorate engineers developed the welding process for the aluminum alloy used to manufacture the new pallet. Under the Metals Affordability Initiative, a consortium between the directorate, industry, and academia, directorate engineers developed the friction stir welding (FSW) process to join longitudinal aluminum extrusions to build the new device.

FSW processing enabled the new pallet to become a reality. Of the five fabrication processes initially considered, FSW was the only one that enabled the Boeing Company to fabricate the Slipper within the program's cost objectives. FSW processing reduced the sandwich assembly cost, including raw materials, extruding, and welding, from 61% to only 19% of the total fabrication cost. The Air Force estimates the total cost savings attributed to FSW (for a projected buy of 140,000 Slippers) at $315 million.

Materials and Manufacturing
Support to the Warfighter

Additional information

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